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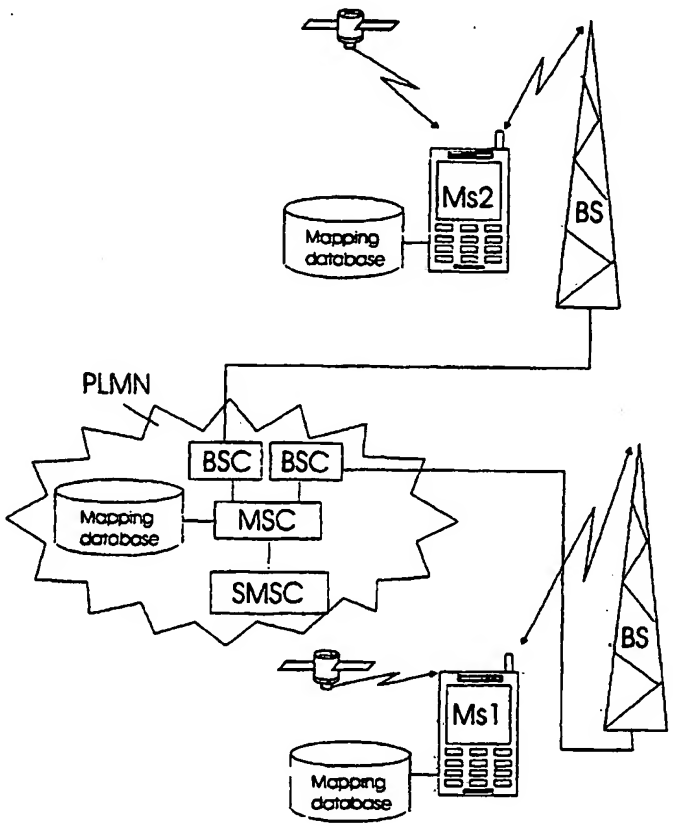
(54) Title: POSITIONING SYSTEM AND METHOD



(57) Abstract: A positioning system which uses the Global Positioning System and a mobile communications network (PLMN), and a computer program for running the positioning system that uses the Global Positioning System and a mobile communications network (PLMN). It is a characteristic of the invention that a position data inquiry can be transmitted from a first mobile station (MS1), which is, for example, a combination of a GSM mobile communications station and a GPS receiver and which can determine positioning data using GPS via a mobile communications network (PLMN), advantageously using an SMS data transmission connection, to a second mobile station (MS2). When this inquiry is affirmatively answered in the second mobile station (MS2), the formation of and transmission of the position data to the first mobile station (MS1) via the mobile communications network (PLMN) is initiated. Lastly, the position of the second mobile station (MS2) is shown on the display of the first mobile station (MS1).

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Positioning System and Method

The present invention relates to a positioning system which uses the Global Positioning System (GPS) and a mobile communications network (PLMN), according to the introductory section of the method Claim 1, and a positioning method which uses GPS and a mobile communications network (PLMN), according to Claim 17.

From EP publication 950598 A1 (Deut Bahn AG), a compact device is known, which comprises a CPU, GPS receiver, GSM module, a combined GPS/GSM antenna, a three-dimensional coordinate-measuring device, user interface and chargeable battery. The parts of the receiver are fit into one casing, and the device is designed to transmit the produced position data, using the GPS receiver, through the GSM network to the customer service center. The device can thus be used to track and monitor moving subjects. The disadvantages of the device are that it only transmits the position data to a previously selected, immobile service center, and that the device cannot be activated into the transmission mode by an outsider.

From DE publication 19640068 A (Alcatel Alsthom cie Gen Electricite), a destination-locating device is already known, which is intended for use, for example, in GPS, GSM and NAV navigation, for determining the actual position of a vehicle. In this device, the valuation unit determines the direction towards the destination. Entered data, such as a phone number, is used to individualize the destination. These are interpreted by a comparison unit in order to obtain the coordinates of the destination, which are then compared with the actual position, in order to display the direction on a monitor or announce it on a loudspeaker. The device is in communication with a GSM communications system in order to procure additional services.

From US patents 5461365 (Dan Schlager et al.), 5650770 (Dan Schlager et al.) and 5963130 (Zoltar Satellite Alarm Systems, Inc.), a wireless system is already known, which is used for monitoring certain remote mobile stations from a base station and for activating alarms when the selected parameter values have been exceeded, for example, when the set distance between a remote station and the base station is exceeded. A remote station, according to US publications 5650770 and 5963130, can include equipment for receiving position data from satellites and for intercession via radio channels from the remote station to the base station. The problem with these kinds of alarm and tracking systems is that they do not have the encompassing range that mobile communications networks, like PLMN's, have, and the radius of effect of these systems is limited to the range of the base station's antenna which radiates 360°. Since this is a question of an alarm and tracking system, this also poses an essential risk, in the event that an alarm is given to a remote station that has, for some reason, drifted beyond the antenna range of the base station.

The primary object of the present invention is to provide a new kind of way to determine the position of a desired subject mobile station(s) of a mobile communications network, by which the position(s) of the subject station(s) is conveyed to the inquiring mobile station of the mobile communications network. A secondary object of the present invention is to eliminate, or at least reduce, the weaknesses and disadvantages already associated with conventional means of position determination and tracking remote stations.

These objects are accomplished by means of the positioning system and method mentioned in the beginning, which uses GPS and a mobile communications network (PLMN), the specific characteristics of which are presented in the accompanying claims.

The invention is thus based on a new and inventive idea, that data on the position of one subject mobile station, which is a combination, for example, of a GSM communications system and a GPS receiver, and which has the capacity to deter-

mine its own position using GPS, is transmitted to the inquiring mobile station through a mobile communications network using a data transmission connection which is supported by the mobile communications network, advantageously SMS (Short Message Service) or a corresponding data transmission system. When this inquiry is affirmatively answered in the second subject mobile station, the formation and transmission of position data through the mobile communications network to the first inquiring mobile station is initiated, and finally, the position of the second mobile station appears on the display of the first mobile station.

According to an advantageous embodiment of the invention, the mobile station comprises a mapping system, whereby, once the subject mobile station's position data has been received in the inquiring mobile station, the position data functions as the key information for displaying a map base on the display of the inquiring mobile station.

When the positioning service is implemented as a network service, the mapping system can be a PLMN element or a service provider system, which is in data transmission communication with a mobile phone center, whereupon the necessary map information can be added to the position data transmitted from the subject mobile station to the inquiring mobile station. Thus, one advantage is that less memory is necessary in the mobile station.

The invention will now be explained in more detail, by way of a certain advantageous embodiment, with reference to the accompanying drawing, in which

FIG.1. diagrammatically illustrates a positioning system, according to the invention, which uses GPS,

FIG. 2 illustrates, with a flow chart, the process of a positioning method, which uses GPS, according to the invention, and

Figure 3 illustrates, with another flow chart, a computer program, according to the invention, for controlling a positioning system which uses GPS and a mobile communications network PLMN.

As Figure 1 illustrates, a system formed according to the invention comprises a mobile communications network PLMN (Public Land Mobile Network), the base stations (BS) which are in communication with mobile communications stations MS1 (Mobile Station 1) and MS2 (Mobile Station 2) via a wireless radio channel. The mobile communications network PLMN differs from fixed telecommunications networks, in that the mobile communications stations MS1 and MS2 can move within the entire network area, and they are involved in active communication with the mobile communications network PLMN. A fixed telecommunications network is a passive network, in which communication between the terminal and the network can only occur from the terminal.

The present invention utilizes the basic characteristics of a mobile communications network PLMN, which can be, for example,
GSM (Global System for Mobile Communications), 900, 1800/1900
PCS (Personal Communications Services)
D AMPS (Digital American Mobile Phone System),
PDC (Personal Digital Cellular)
UMTS (Universal Mobile Telecommunications System).
Mobile communications network PLMN terminals are not technically bound to a defined location, such as an electrical network or stationary communications telenetwork connection, and an essentially broad, encompassing service area is characteristic to a mobile communications network. Additionally, in a system formed according to the invention, the mobile communications stations MS1 and MS2 comprise a combination of a mobile communications system intended for telecommunications, and a GPS receiver for navigation. Thus, a terminal formed according to the invention is able to determine its own position data using GPS (Global Positioning System) satellite 2, and to transmit its position data to the mobile communications network PLMN.

In the mobile communications network, regardless of the type of network, short message and/or data transmission has been pre-defined, and/or standardized, without exception, and therefore is already known to professionals in the field. Concerning these, reference here is only being made to network-related recommendations, stipulations and standards. For example, ETSI publications GSM 04-11, GSM 03-40 and GSM 07-05 relate to the transmission of short messages in GSM and/or UMTS mobile communications network.

In a recommended embodiment of the invention, in addition to a program memory, the GPS/GSM mobile station also comprises a mapping system or database 1, whereupon using the GPS satellite map coordinates and a map base, based on the map coordinates obtained from the mapping database, the position of a GPS/GSM mobile station, at any given time, can be made graphically visible on the map base. When an inquiry for position data is sent as a data transmission using a data transmission method which supports mobile communications networks, advantageously SMS or a corresponding method, from the first inquiring mobile station MS1 to the second mobile station MS2, and when this position data inquiry is affirmatively answered at the second mobile station MS2, an action is triggered, which joins the map coordinates and the map base, and encloses this body of data into the first mobile station as a reply message, using data transmission based on a data transmission method, which supports the mobile communications network, advantageously SMS, GSM-data, or corresponding method. The first mobile station MS1 automatically or manually decodes the received reply using the menu function, and shows the position of the second mobile communications station MS2 on a map base on its display.

In this context, it must be noted, that it is not necessary to include a map base indicating the position of the second mobile station MS2 in the reply message being formulated in the second mobile station for transmission to the inquiring mobile station MS1; rather, alternatively, only the map coordinates, which were obtained using GPS, are transmitted from the second mobile station MS2, and a map base is selected from the mapping system or database 1 in the first mobile station MS1,

on the basis of these map coordinates of the second mobile station MS2, and the position data of the second mobile station appears on the display of the inquiring mobile station MS1 on a map base.

Further, it must be noted, that the mapping system or database 1, can also take the form of a mobile communications network PLMN element. Thus, it would not be necessary to equip any of the mobile stations MS with a mapping system or database. Instead, only coordinate data about the positioning of the second mobile station MS2 obtained using GPS is transmitted from the second station MS2 as a reply to the position data inquiry to the PLMN. The coordinate data forms the basis according to which the map base is added from the mapping system or database to the coordinate data, and this comprehensive body of data is then transmitted as a data transmission, using a transmission method supported by a mobile communications network, advantageously SMS or other such method, to the first mobile station MS1, which decodes the received data message, either automatically or manually, for example, using the menu function, and shows the positioning of the second mobile station MS2 on its display on a map base.

The mapping system or database 1 can also be implemented using a service provider system (not illustrated in Figure 1) which is in communication with a mobile communications network PLMN. Thus, it would not be necessary to equip any of the mobile stations MS with a mapping system or database, whereupon the first connection to the service provider system is made as a data transmission connection from the first mobile station MS1, advantageously via SMS or other data transmission method supported by a mobile communications network; a data transmission connection to the second mobile station MS2 then being further formed from the service provider system, advantageously in the form of an SMS transmission or other data transmission method supported by a mobile communications network, in order to transmit the position data inquiry, while the positioning coordinates for the second mobile station MS2, which are obtained using GPS, are transmitted as a reply to the position data inquiry, advantageously by SMS or other data transmission method supported by a mobile communications network,

from the second mobile station MS2 as a data transmission to the service provider system, which is connected to the PLMN. This coordinate data then forms the basis used by the mapping system or database of the service provider to integrate the map base with the coordinate data. This comprehensive body of data is then transmitted, advantageously using SMS or other data transmission method supported by a mobile communications network, to the first mobile station MS1, which decodes the received data message, either automatically or manually, for example, using the menu function, and shows the position of the second mobile communications station MS2 on a map base on its display.

According to the invention, the second mobile station MS2 can reply to the position data inquiry automatically, whereupon there is a register connected to the program memory which is in the second mobile station MS2, and which controls the positioning system. The register is a record of those inquiring for positioning data, advantageously the subscriber number and A-connections of the inquirers, thus the second mobile station MS2 can respond automatically to position data inquiries made by those inquirers, according to the program which controls the system. According to the invention, the reply to the position data inquiry made by the second mobile station MS2 can also be made manually, whereupon, according to the computer program which runs the system, a selection can be made at the second mobile station MS2, to either enable the reply, or to disable it; according to the invention, it is advantageous to base the selection on the menu function of the program which runs the system.

According to the invention, the decode and display position inquiry item on the computer program which controls the positioning system in the first mobile station MS1, decodes the received data message and shows the position of the second mobile station MS2 on a map base on the display at the first mobile station MS1, either manually, for example using the menu function included in the computer program, or automatically, immediately and directly controlled by the computer program.

Figure 2 illustrates a computer-controlled GPS and a positioning system which uses a mobile communications network PLMN, according to the invention, for manually determining the position of the desired second independent mobile station MS2, from the inquiring, first independent mobile station MS1. This kind of computer-program-operated comprehensive system minimally comprises the phases:

- Formation of the position inquiry in the first mobile station MS1,
- Transmission of the position inquiry from the first mobile station MS1,
- Reception of the position inquiry at the second mobile station MS2,
- Determination of the positioning of the second mobile station MS2 in the second mobile station,
- Transmission of the reply to the position inquiry from the second mobile station,
- Reception of the position inquiry reply at the first mobile station MS1, and
- Display of the second mobile station's MS2 positioning at the first mobile station MS1.

When the invention concerns the tracking of a second independent mobile station MS2, independent of the first independent mobile station MS1, the computer program which runs the system, according to an advantageous embodiment of the invention, comprises at least two parts, such that the items of the computer program, which control the following phases—formation of the position inquiry, transmission of the position inquiry, reception of the position inquiry reply, and display of the positioning of the second mobile station MS2—are set up in the first mobile station MS1, and such that the computer program items which control the following phases—reception of the position inquiry, determination of the second mobile station's MS2 position, and transmission of the reply to the position inquiry—are set up in the second mobile station MS2.

In order to enable the position of the second mobile station MS2 to appear on the display of the first mobile station MS1 on a map base, the computer program includes an additional phase, whereby the map information corresponding to the position of the second mobile station MS2 is incorporated into the position inquiry

reply message from the second mobile station MS2. The computer program item which controls this phase is thus in the second mobile station MS2.

The position of the second mobile station MS2 can also appear on the first mobile station's MS1 display on a map base thus; the computer program includes an additional phase, in which the map information corresponding to the positioning of the second mobile station MS2, is integrated into the position inquiry reply after the position inquiry reply has been received at the first mobile station MS1. Thus, the computer program item which controls this phase is in the first mobile station.

If the mapping system or database in a system according to the invention is set up for a PLMN, or for a service provider system which is in communication with a PLMN, the item of the computer program which controls the integration of the map information with the position data of the second mobile station, which is included in the position data inquiry reply, is correspondingly adapted either to the PLMN element or to the service provider system, to which the mapping system or database is connected.

Figure 3 illustrates, in the form of a flow chart, a computer program, according to the invention, for controlling a positioning system and method which uses GPS and a mobile communications network PLMN, with the objective of determining the position of the second independent mobile station MS2 from the first independent mobile station MS1.

When run by a computer program, the following phases occur consecutively after the positioning process has been activated or initiated:

- formation of the position inquiry in the first mobile station MS1,
- transmission of the position inquiry from the first mobile station MS1, whereupon the second independent mobile station MS2 is the destination address in the transmission,
- reception of the position inquiry at the second mobile station MS2,

- determination of the positioning of the second mobile station MS2 using GPS in the second mobile station,
- transmission of the reply to the position inquiry from the second mobile station MS2, whereupon the first mobile station MS1 is the destination address in the transmission,
- reception of the position inquiry reply at the first mobile station MS1,
- display of the second mobile station's MS2 positioning at the first mobile station MS1.

According to a specific embodiment of the invention, the position of the second mobile station MS2 is shown on the display of the first mobile station MS1 on a map base. In order for this to happen, there is a mapping system or database 1 in the first mobile station, from which, on the basis of the position of the second mobile station MS2, the correct map base information is obtained, so that it is incorporated into the position data inquiry reply transmitted to the first mobile station MS1. Alternatively, the position inquiry reply transmitted from the second mobile station MS2 may only include the position coordinates of the second mobile station MS2, and the first mobile station MS1 then has a mapping system or database 1, from which, on the basis of the position of the second mobile station MS2, the correct map base can be obtained after the position inquiry reply has been received, to be displayed integrated at the first mobile station MS1. It must still be stated, that the mapping system or database 1 can also be set up for a PLMN, or for a service provider system which is in communication with a PLMN, whereupon the map base is incorporated into the position inquiry reply transmitted in the PLMN, or service provider system which is in communication with a PLMN, from the second mobile station MS2, and the position of the second mobile station MS2 is shown on a map base on the display of the first mobile station MS1.

The invention has only been explained above by way of its alternative examples of application and by way of its certain advantageous embodiment. This is naturally not to be limited in any way, and, as is evident to the professionals of the

field, many alternative applications and variations are possible within the scope of the frames of the new and inventive idea, defined in the accompanying claims.

Claims

1. A positioning system which uses GPS positioning and a mobile communications network (PLMN), **characterized** by the following system phases:

i. a position inquiry is transmitted as a data transmission via a mobile communications network (PLMN) from a first inquiring mobile communications station (MS1), which is equipped with a GPS receiver, to a second mobile communications station (MS2), which is also equipped with a GPS receiver and about which position data is desired,

ii. when an affirmative reply is given to the position inquiry at the second mobile communications station (MS2), the formation and transmission of the position data is initiated,

iii. the position data is transmitted as a data transmission in a reply message from the second mobile station (MS2) via the mobile communications network (PLMN) to the first mobile station (MS1),

iv. the position of the second mobile station (MS2) is shown on the display of the first mobile station (MS1).

2. A positioning system according to Claim 1, **characterized** in that the system comprises a mapping system or database (1) for adding map base information about the second mobile station (MS2) as a data transmission to the reply message.

3. A positioning system according to Claim 2, **characterized** in that the mapping system or database (1) is adapted to the first and/or second mobile station (MS1, MS2).

4. A positioning system according to Claims 2 and 3, **characterized** in that the reply message transmitted to the first mobile station (MS1) from the second mobile station (MS2) in response to the position data inquiry includes both the map base information and the position data about the second mobile station (MS2), and

in that the comprehensive body of data in the reply message is decoded in the first mobile station (MS1).

5. A positioning system according to Claims 2 and 3, **characterized** in that the reply message transmitted to the first mobile station (MS1) from the second mobile station (MS2) in response to the position data inquiry only includes position data about the second mobile station (MS2), and in that a map base corresponding to the second mobile station (MS2) position data is obtained from the mapping system or database (1) of the first mobile station (MS1), on the basis of the second mobile station (MS2) position data received at the first mobile station (MS1), and in that the comprehensive body of data in the reply message is decoded in the first mobile station (MS1).

6. A positioning system according to Claim 2, **characterized** in that the mapping system or database (1) is adapted as a mobile communications network (PLMN) element.

7. A positioning system according to Claims 2 and 6, **characterized** in that the reply message transmitted from the second mobile station (MS2) to the first mobile station (MS1) includes the position data about the second mobile station (MS2), and in that a map base corresponding to the second mobile station (MS2) position data is obtained from the mapping system or database (1) of the mobile communications network (PLMN), on the basis of the second mobile station (MS2) position data in the mobile communications network (PLMN), after which the position data of the second mobile station (MS2) and the retrieved map base data are integrated into the reply message, which is transmitted to and decoded at the first mobile station (MS1).

8. A positioning system according to Claim 2, **characterized** in that the mapping system or database (1) is adapted to a service provider system which is connected to a mobile communications network (PLMN).

9. A positioning system according to Claims 2 and 8, **characterized** in that the position data inquiry is transmitted from the first mobile station (MS1) to the second mobile station (MS2) as a data transmission connection via the service provider system, and in that the reply message in response to the position data inquiry is transmitted from the second mobile station (MS2) as a data transmission to the service provider system and comprises the second mobile station (MS2) position coordinates, which have been obtained using GPS and on the basis of which the service provider's mapping system or database integrates the map base and the coordinate data, after which the comprehensive body of data of this reply message is transmitted to the first mobile station (MS1) as a data transmission, and in that the comprehensive body of data of the reply message is decoded in the first mobile station (MS1).

10. A positioning system according to any of the preceding Claims 1-9, **characterized** in that the position data inquiry from the first mobile station (MS1) to the second mobile station (MS2), and vice versa, is a data transmission, which is based on data transmission which is supported by the mobile communications network and which is advantageously SMS or a corresponding form of data transmission.

11. A positioning system according to any of the preceding Claims 1-10, **characterized** in that, in order for the position data inquiry to be manually answered at the second mobile station (MS2), an option is selected in the computer program which runs the positioning system, which either enables the reply, or disables it.

12. A positioning system according to Claim 11, **characterized** in that selection is based on the menu function of the computer program which runs the system.

13. A positioning system according to any of the preceding Claims 1-10, **characterized** in that, in order for the position inquiry to be automatically answered at the second mobile station, a register is connected to the program memory which runs the system, which contains the position inquirers, advantageously a list of the

subscriber numbers or A-connections of the inquirers, the position inquiries of whom the second mobile station (MS2) answers automatically, according to the program which runs the system.

14. A positioning system according to any of the preceding Claims 1-13, **characterized** in that the reply to the position data inquiry becomes visible at the first mobile station (MS1) automatically when the system is being run by the computer program.

15. A positioning system according to any of the preceding Claims 1-13, **characterized** in that, in order to display the position data inquiry reply at the first mobile station (MS1) manually, an option is selected in the computer program which runs the positioning system, which either enables the reply to be displayed, or disables it.

16. A positioning system according to any of the preceding Claims 1-15, **characterized** in that the computer program which runs the positioning system has at least two parts, whereupon one item of the computer program, which runs these phases--

- formation of the position inquiry,
- transmission of the position inquiry,
- reception of the reply to the position inquiry and
- the displaying of the position of the second mobile station (MS2)--

is located in the program memory of the first mobile station (MS1),

and whereupon the second item of the computer program, which runs these phases--

- the reception of the position inquiry,
- the determination of the position of the second mobile station (MS2) and
- transmission of the reply to the position inquiry--

is located in the program memory of the second mobile station (MS2).

17. A positioning method which uses GPS and a mobile communications network (PLMN), which is controlled by a computer program to determine the positioning of a second mobile station (MS2) from a first inquiring station (MS1), **characterized** in that the positioning method comprises the phases:

i. formation of the position inquiry in the first mobile station (MS1), which is a combination of a mobile communications station and a GPS receiver,

ii. transmission of the position inquiry from the first mobile station (MS1),

iii. reception of the position inquiry in the second mobile station (MS2), which is a combination of a mobile communications station and a GPS receiver,

iv. determination of the positioning of the second mobile station (MS2) in the second mobile station using GPS,

v. transmission of the reply to the position inquiry from the second mobile station,

vi. reception of the reply to the position inquiry at the first mobile station (MS1),

vii. display of the positioning of the second mobile station (MS2) at the first mobile station (MS1).

18. A positioning method according to Claim 17, **characterized** in that when the positioning system is controlled by a computer program, which comprises at least two parts, the method phases--

i. formation of the position inquiry,

ii. transmission of the position inquiry,

iii. reception of the reply to the position inquiry and

iv. display of the positioning of the second mobile station (MS2)--

are controlled by a computer program item, which is located in the program memory of the first mobile station (MS1), and in that, when run with the computer program, the method phases--

v. reception of the position inquiry,

vi. determination of the positioning of the second mobile station (MS2) and

vii. transmission of the reply to the position inquiry--

are controlled by an item of the computer program, which is located in the program memory of the second mobile station (MS2).

19. A positioning method according to Claim 17 and/or 18, **characterized** in that, before the transmission of the second mobile station's (MS2) position data is carried out, in a method controlled by a computer program, there is an additional phase, in which the mapping information which corresponds to the position of the second mobile station (MS2) is integrated into the position data inquiry reply before the position data inquiry reply is received at the first mobile station (MS1) .

20. A positioning method according to Claim 17 and/or 18, **characterized** in that an additional phase is carried out in the computer program controlling the method, in which the mapping information which corresponds to the position of the second mobile station (MS2) is integrated into the position data inquiry reply after the position data inquiry reply is received at the first mobile station (MS1).

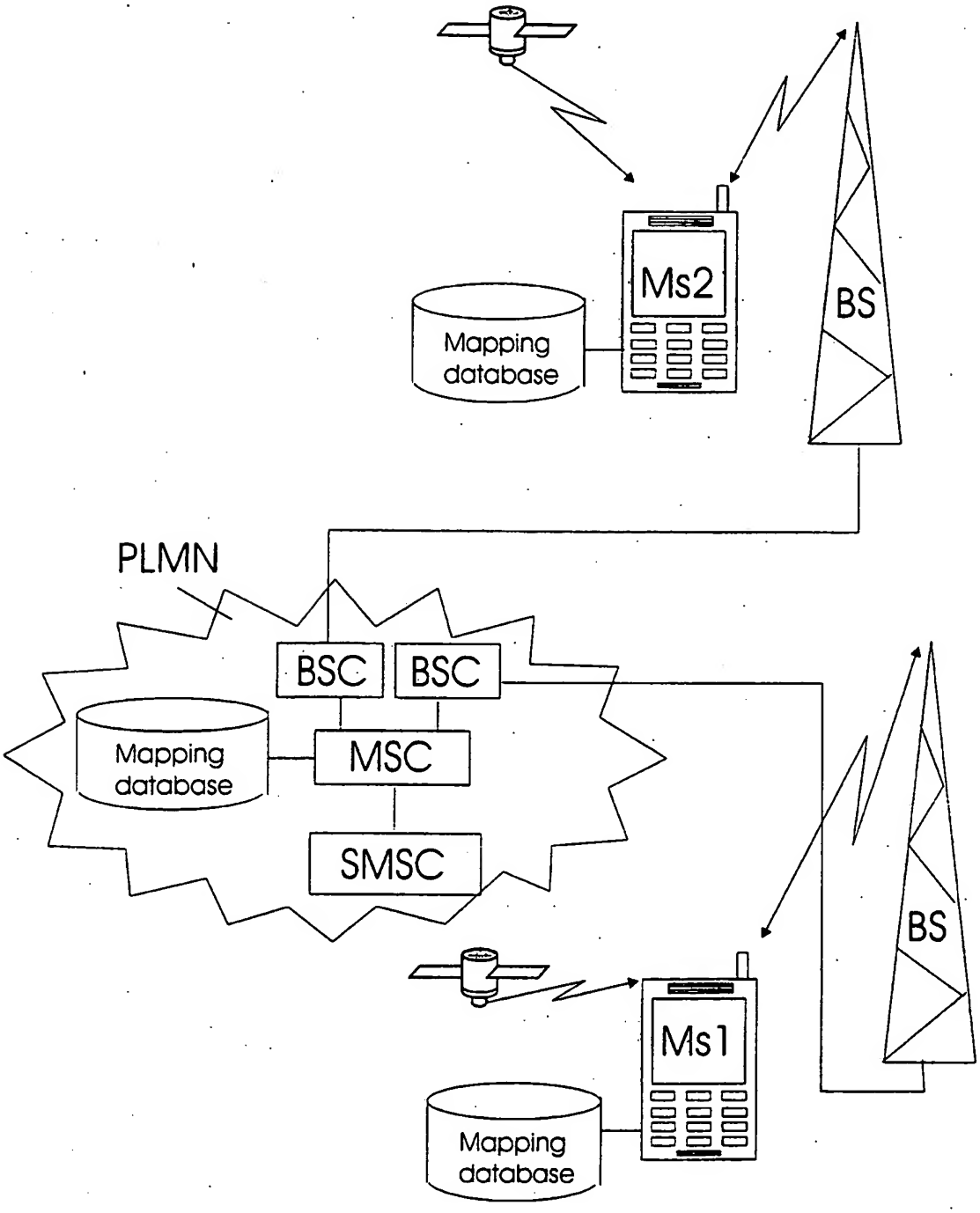
Ms2
BS
Mapping database
PLMN
BSC
BSC
Mapping database
MSC
SMSC
BS
Ms1
Mapping database

FIG.1.

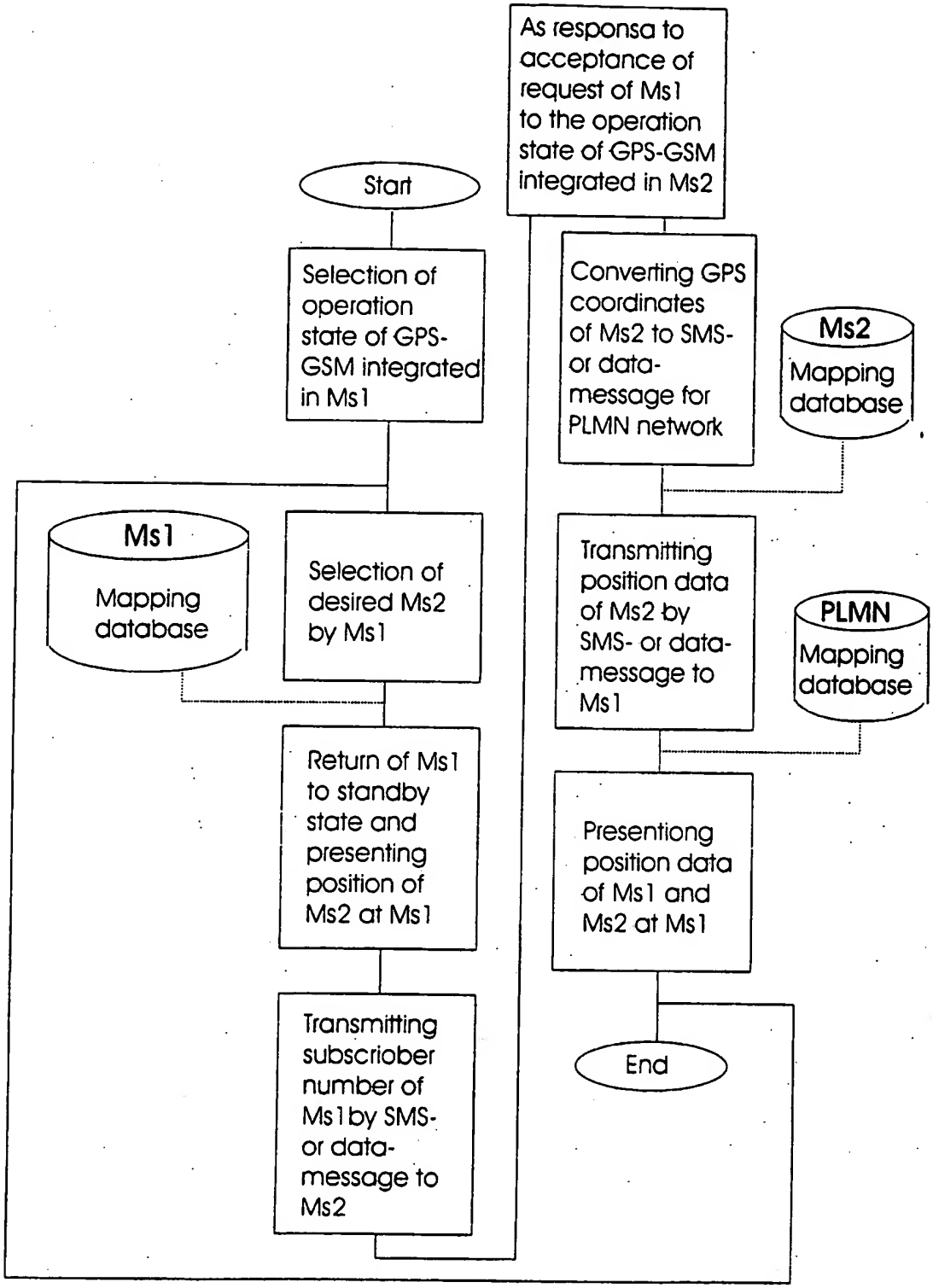
As responsa to acceptance of request of Ms1 to the operation state of GPS-GSM integrated in Ms2
Start
Selection of operation state of GPS-GSM integrated in Ms1
Converting GPS coordinates of Ms2 to SMS- or data-message for PLMN network
Ms2
Mapping database
Ms1
Mapping database
Selection of desired Ms2 by Ms1
Transmitting position data of Ms2 by SMS- or data-message to Ms1
PLMN
Mapping database
Return of Ms1 to standby state and presenting position of Ms2 at Ms1
Presentiong position data of Ms1 and Ms2 at Ms1
Transmitting subscriober number of Ms1 by SMS- or data-message to Ms2
End

FIG.2

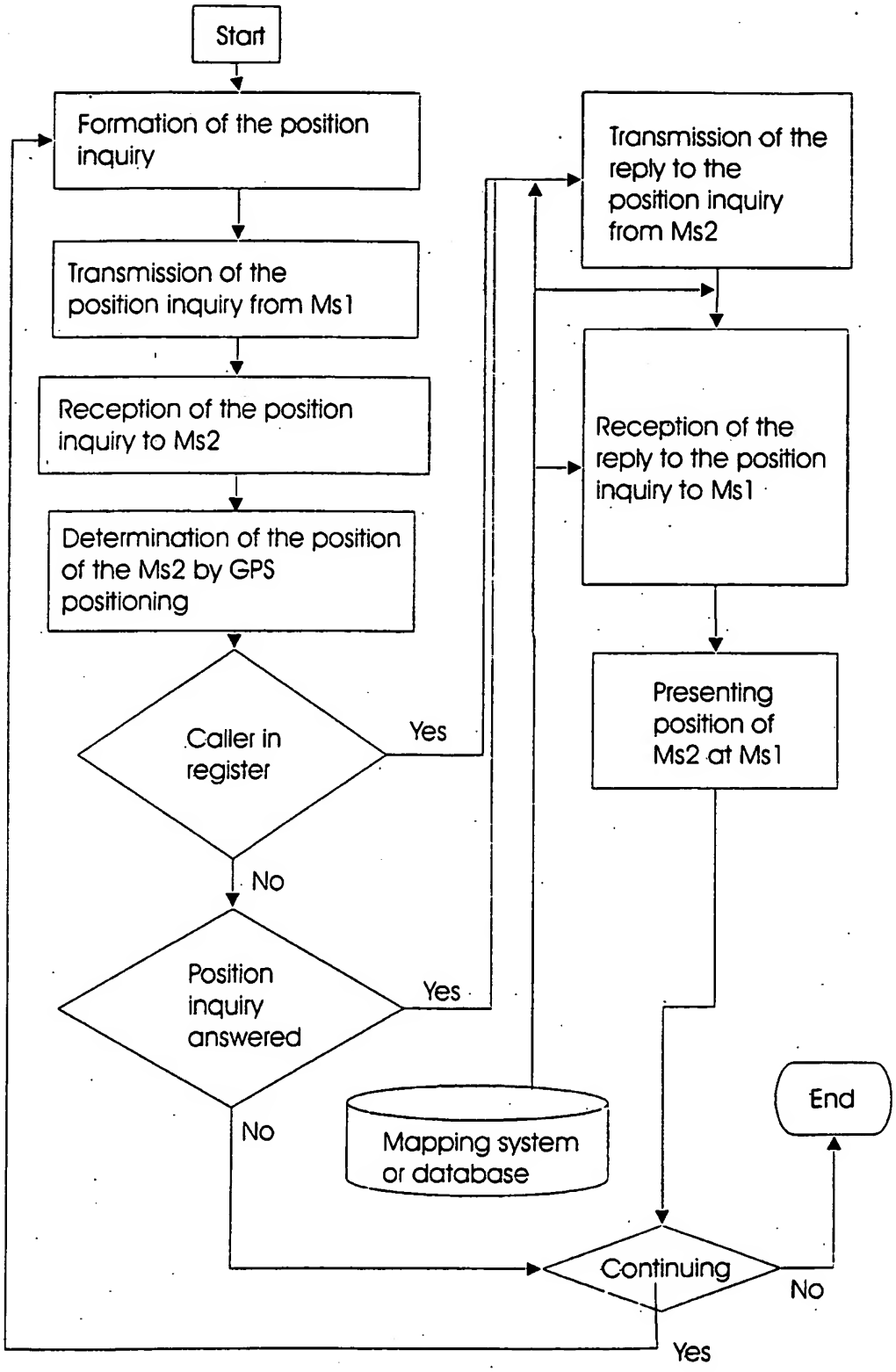
Start
Formation of the position inquiry
Transmission of the position inquiry from Ms1
Reception of the position inquiry to Ms2
Determination of the position of the Ms2 by GPS positioning
Caller in register
Yes
No
Position inquiry answered
Yes
No
Mapping system or database
Transmission of the reply to the position inquiry from Ms2
Reception of the reply to the position inquiry to Ms1
Presenting position of Ms2 at Ms1
End
Continuing
No
Yes

FIG.3.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 01/00112

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04Q 7/38
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI,PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9800988 A2 (ERICSSON INC.), 8 January 1998 (08.01.98), figure 1, claims 1-2 --	1-10,17
X	WO 9852379 A1 (TELEFONAKTIEBOLAGET LM ERICSSON), 19 November 1998 (19.11.98), figure 4, claims 1-2 --	1-10,17
X	WO 0044188 A1 (SIEMENS AKTIENGESELLSCHAFT), 27 July 2000 (27.07.00), page 4, line 1 - page 6, line 2, figure 1 --	1-7,10,17, 19-20
X	Patent Abstracts of Japan, abstract of JP 8-212497 A (AQUEOUS RES:KK), 20 August 1996 (20.08.96), see fig. 1-3, abstract --	1-10,17

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 April 2001	25 -04- 2001
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Beata Slusarczyk/Els Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

Information on patent family members

02/04/01

International application No.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9800988 A2	08/01/98	AU 3592797 A	21/01/98
WO 9852379 A1	19/11/98	AU 5073598 A	29/05/98
		AU 7558298 A	08/12/98
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		EP 0977476 A	09/02/00
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WO 0044188 A1	27/07/00	NONE	